



AF <sup>THW</sup>

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the application of:  
PRANABES K. PRAMANIK

Docket: OM-11

Serial Number: 10/782,130

Group Art Unit: 1773

Filed: February 19, 2004

Examiner: Kevin R. Kruer

For: A NOVEL THIN LAMINATE AS EMBEDDED CAPACITANCE  
MATERIAL IN PRINTED CIRCUIT BOARDS

**SUBSTITUTE APPEAL BRIEF**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

This is an Appeal to the Board of Patent Appeals and Interferences from the Final Rejection of claims 1-13, 15, 18-33, 37-42, 44 and 47 mailed February 7, 2006 in the above- identified case. A Notice of Appeal was filed. An oral hearing is not requested. This substitute Appeal Brief is filed in response to the Notice of Non-Compliant Appeal Brief mailed August 8, 2006.

A credit card authorization was previously submitted for the required notice of appeal fee of \$500.00 and the appeal brief fee of \$500.00 (total \$1,000.00). In the event that the Commissioner determines that an additional extension of time is required in order for this submission to be timely, it is requested that this submission include a petition for an additional extension for the required length of time and the Commissioner is authorized to charge any other fees necessitated by this paper to this credit card. This substitute Appeal Brief is in response to the notification mailed July 13, 2006.

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#### I. REAL PARTY IN INTEREST

The real party in interest is OAK-MITSUI, INC., the assignee of record.

#### II. RELATED APPEALS AND INTERFERENCES

With respect to other appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal, please note that there are no other related applications on appeal or subject to an interference known to appellant, appellant's legal representative or the assignee.

#### III. STATUS OF CLAIMS

The claims in the application are 1-47. Claims 1-13, 15, 18-33, 37-42, 44 and 47 are pending, stand rejected and are on appeal. Claims 14, 16-17, 43, and 45-46 have been cancelled. Claims 34-36 have been withdrawn. No claims are allowed.

#### IV. STATUS OF AMENDMENTS

A timely response to the final rejection was filed on March 10, 2006. No claims were amended.

#### V. SUMMARY OF THE CLAIMED SUBJECT MATTER

1. A multilayered construction suitable for forming capacitors which is formed by a process which comprises:
  - a) applying a first thermosetting polymer layer onto a surface of a first electrically conductive layer;
  - b) applying a central polymerizable layer onto a surface of the first thermosetting polymer layer, which central polymerizable layer comprises a polymerizable precursor of a polyethylene terephthalate, a polyethylene naphthalate, a polyvinyl carbazole, a polyphenylene sulfide, an aromatic polyamide, a polyether-nitrile, a polyether-ether-ketone, or combinations thereof;

- c) applying a second thermosetting polymer layer onto a surface of a second electrically conductive layer; thereafter
  - d) attaching the first electrically conductive layer to the second electrically conductive layer such that each of the first and second thermosetting polymer layers and the central polymerizable layer are positioned between the first and second electrically conductive layers; and thereafter
  - e) polymerizing said polymerizable layer;
- wherein each of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer optionally further comprises a filler material.

The features of this claim can be found throughout the specification, particularly on page 6 line 8 through page 7 line 7, as well as in FIG.1 and in the originally filed claim 14. The first and second electrically conductive layers, 12 and 20 respectively in FIG.1, are described in detail in the specification on page 7, line 27, through page 10, line 21. The first and second thermosetting polymer layers, 14 and 18 respectively in FIG.1, are described in detail in the specification on page 10, line 23, through page 11, line 28. The central polymerizable layer, 16 in FIG.1, is described in detail in the specification on page 12, line 1, through page 15 line 15.

37. A multilayered construction suitable for forming capacitors which comprises:

- a) a first electrically conductive layer, having first and second surfaces;
- b) a first thermosetting polymer layer, having first and second surfaces, on the first electrically conductive layer with the first surface of the first thermosetting polymer layer on the second surface of the first electrically conductive layer;
- c) a central polymerizable layer, having first and second surfaces, on the first thermosetting polymer layer with the first surface of the central polymerizable layer on the second surface of the first thermosetting polymer layer, which central polymerizable layer comprises a polymerizable precursor of a polyethylene terephthalate, a polyethylene naphthalate, a polyvinyl carbazole, a polyphenylene sulfide, an aromatic polyamide, a polyether-nitrile, a polyether-ether-ketone, or combinations thereof;

d) a second thermosetting polymer layer, having first and second surfaces, on the central polymerizable layer with the first surface of the second thermosetting polymer layer on the second surface of the second surface of the central polymerizable layer; and  
e) a second electrically conductive layer, having first and second surfaces, on the second thermosetting polymer layer with the first surface of the second electrically conductive layer on the second surface of the second thermosetting polymer layer;  
wherein each of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer optionally further comprises a filler material.

Support for this claim can be found throughout the specification, particularly on page 6 line 8 through page 7 line 7, as well as in FIG.1 and in the originally filed claim 43. As stated above, the first and second electrically conductive layers, 12 and 20 respectively in FIG.1, are described in detail in the specification on page 7, line 27, through page 10, line 21. The first and second thermosetting polymer layers, 14 and 18 respectively in FIG.1, are described in detail in the specification on page 10, line 23, through page 11, line 28. The central polymerizable layer, 16 in FIG.1, is described in detail in the specification on page 12, line 1, through page 15 line 15.

#### VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

(a) Claims 1-13, 15, 18-33, 37-42, and 47 stand rejected under 35 U.S.C. 103 over Appelt et al. (US 2001/0005304 A1) in view of Fenoglio et al. (US 5,003,037).

#### VII. ARGUMENTS

(a) The Examiner has rejected claims 1-13, 15, 18-33, 37-42, and 47 under 35 U.S.C. 103 as being unpatentable over Appelt et al. in view of Fenoglio et al.

Appellants wish to point out that the currently pending claims in this application are identical with those of the corresponding PCT application (PCT/US2005/001820) filed

on January 19, 2005. It should be noted that the examiner for the present application is the same examiner, Kevin R. Kruer, who examined the corresponding PCT application. In examining the PCT application, Examiner Kruer considered all of the PCT claims to be novel, inventive, and having inventive step in view of Applicant's same arguments against the same references as presently cited, namely Appelt et al. and Fenoglio et al. In the Evidence Appendix, Appellants have attached a full copy of the International Preliminary Examination Report mailed on March 6, 2006, which includes Examiner Kruer's comments regarding the novelty, inventiveness, and inventive step of the PCT claims. These PCT claims are identical to those currently on appeal herein, and a full copy of the PCT claims is included in the IPER of the Evidence Appendix. It is respectfully urged that examiner's current rejection of the present claims under 35 U.S.C. 103 shows an inconsistency in reasoning, and that the final rejection of these claims should be overruled. This PCT evidence was before the examiner and argued in the March 10, 2006 response to the Final Rejection, and the examiner responded to this evidence in the March 30, 2006 Advisory Action. It is therefore a part of the record of this application. If necessary, it is requested that the Board take administrative notice of the USPTO agency action, under Federal Rule of Evidence 201, as well as 37 C.F.R. 41.152-154.

Regarding the rejection itself, the Examiner takes the position that it would have been obvious to replace a polyimide central layer of Appelt's structure with one of Fenoglio's polyamide-imide layers in order to formulate a structure of the present claims having a polyamide central layer. Appellants respectfully submit that this is not the case, and that there is no teaching in either reference which would inspire one skilled in the art to do so.

The present claims are directed to a multilayered construction suitable for forming capacitors which is formed by a process which comprises:

- a) applying a first thermosetting polymer layer onto a surface of a first electrically conductive layer;

- b) applying a central polymerizable layer onto a surface of the first thermosetting polymer layer, which central polymerizable layer comprises a polymerizable precursor of a polyethylene terephthalate, a polyethylene naphthalate, a polyvinyl carbazole, a polyphenylene sulfide, an aromatic polyamide, a polyether-nitrile, a polyether-ether-ketone, or combinations thereof;
- c) applying a second thermosetting polymer layer onto a surface of a second electrically conductive layer; thereafter
- d) attaching the first electrically conductive layer to the second electrically conductive layer such that each of the first and second thermosetting polymer layers and the central polymerizable layer are positioned between the first and second electrically conductive layers; and thereafter
- e) polymerizing said polymerizable layer;

wherein each of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer optionally further comprises a filler material.

In the previous amendment, mailed November 17, 2005, claim 1 was amended to incorporate the subject matter of claim 14, but with the *exclusion of polyimides and polyamide-polyimides*. Claim 14 originally related to “The multilayered construction of claim 1 wherein the central polymerizable layer comprises a polymerizable precursor of a polyethylene terephthalate, a polyethylene naphthalate, a polyvinyl carbazole, a polyphenylene sulfide, an aromatic polyamide, *a polyimide, a polyamide-polyimide*, a polyether-nitrile, a polyether-ether-ketone, or combinations thereof.” Similarly, claim 37 was amended to include the subject matter of claim 43, with the exclusion of polyimides and polyamide-polyimides. Claims 14 and 43 were cancelled accordingly. Also, claims 16-17 and 45-46, which stated that the central polymerizable layer comprises a polymerizable *polyimide* precursor, or a *combination* of a polymerizable polyamide precursor and a polymerizable *polyimide*, were canceled. Claims 25-26 were amended to remove the phrases regarding polymerizable *polyimide* precursors or a combination of a

polymerizable polyamide precursor and a polymerizable *polyimide* precursor. Therefore, it is clear that the present claims exclude a polyimide-containing central layer.

While Appelt does teach a multilayered structure, it fails to teach the structure of the present invention which requires a central polymerizable layer as presently claimed. Specifically, Appelt fails to teach a central polymerizable layer which may include an *aromatic polyamide*. Appelt's Fig. 5B shows an embodiment where there structure includes five layers. However, this embodiment has a central sheet 32 of a *polyimide* between two dielectric layers 13. It is urged that not only does Appelt fail to teach the presently required polymerizable precursor materials, but the word "polyamide" does not appear anywhere in Appelt's disclosure. Furthermore, for the reasons stated above, it is urged that none of the presently claimed materials would satisfy Appelt's central *polyimide* layer.

The Examiner next cites Fenoglio in an attempt to fill the voids of Appelt. That is, the Examiner asserts that it would have been obvious to replace the central *polyimide* layer of Appelt with a *polyamide-imide* copolymer of Fenoglio, in order to formulate the presently claimed structure in an embodiment wherein the present central layer includes an *aromatic polyamide*. Applicants respectfully submit that this is not the case.

Fenoglio relates to the use of 3,5-diamino-t-butylbenzene for forming polyamide, polyimide, and polyamide-imide polymers and copolymers. However, Fenoglio does nothing more than describe the formulation of such polymeric materials. It does not describe the use of these materials as polymerizable precursor components of a multi-layer structure. It further does not teach or suggest *how* or *why* one would modify Appelt to devise the presently claimed invention. Nothing in Appelt teaches or suggests that a polyamide-polyimide copolymer would be suitable in place of their central polyimide layer. Furthermore, since polyimides and polyamide-polyimides have been clearly *excluded* from the claims as a possible component in the central layer, the Examiner has



no basis for stating that one would have used Fenoglio's polyamide-imide in Appelt's central layer position in an effort to formulate the present claims.


It is urged that the Examiner is incorrectly attempting to bridge the gap between Appelt and the present claims using Fenoglio's polyamide-imide. That is, he considers Fenoglio's polyamide-imide as a polyimide in the context of Appelt, yet as a polyamide in the context of the present claims. However, he does not consider the exclusion of polyimides from the present claims, or the absence of polyamide anywhere in Appelt's disclosure.

"Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination." In re Geiger, 2 U.S.P.Q.2d 1276, 1278 (CAFC 1987). The invention cannot be deemed unpatentable merely because, in a hindsight attempt to reconstruct the invention, one can find elements of it in the art; it must be shown that the invention as a whole was obvious at the time the invention was made without knowledge of the claimed invention. 35 U.S.C. 103. That is, there must be something in the art to suggest that particular combination other than hindsight gleaned from the invention itself, something to suggest the desirability of the combination. Uniroyal, Inc. v. Rudkin-Wiley Corp., 5 U.S.P.Q.2d 1434, 1438 (CAFC 1988). In this case, the Examiner has not provided any motivation or advantage for substituting Appelt's polyimide layer with Fenoglio's polyamide-imide layer to arrive at the instant invention. Therefore, Applicants respectfully urge that the Examiner is impermissibly reconstructing the art in light of the present disclosure.

None of the cited references, taken alone or in combination, teaches or suggests the invention claimed by Applicants. For all the above reasons, claims 1-13, 15, 18-33, 37-

42, and 47 are urged to be patentable over the cited references, and the rejections under 35 U.S.C.103 should be overruled.

Respectfully submitted,



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Date: August 30, 2006

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage pre-paid in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on August 30, 2006.

  
Richard S. Roberts

## VIII. CLAIMS APPENDIX

1. A multilayered construction suitable for forming capacitors which is formed by a process which comprises:
  - a) applying a first thermosetting polymer layer onto a surface of a first electrically conductive layer;
  - b) applying a central polymerizable layer onto a surface of the first thermosetting polymer layer, which central polymerizable layer comprises a polymerizable precursor of a polyethylene terephthalate, a polyethylene naphthalate, a polyvinyl carbazole, a polyphenylene sulfide, an aromatic polyamide, a polyether-nitrile, a polyether-ether-ketone, or combinations thereof;
  - c) applying a second thermosetting polymer layer onto a surface of a second electrically conductive layer; thereafter
  - d) attaching the first electrically conductive layer to the second electrically conductive layer such that each of the first and second thermosetting polymer layers and the central polymerizable layer are positioned between the first and second electrically conductive layers; and thereafter
  - e) polymerizing said polymerizable layer;wherein each of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer optionally further comprises a filler material.
2. The multilayered construction of claim 1 wherein at least one of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer further comprises a filler material.
3. The multilayered construction of claim 1 wherein both of said first and second thermosetting polymer layers further comprise a filler material.
4. The multilayered construction of claim 1 wherein said central polymerizable layer further comprises a filler material.

5. The multilayered construction of claim 1 wherein each of said first thermosetting polymer layer, second thermosetting polymer layer and said central polymerizable layer further comprise a filler material.
6. The multilayered construction of claim 1 wherein said filler material comprises a material selected from the group consisting of ceramics, barium titanate, boron nitride, aluminum oxide, silica, strontium titanate, barium strontium titanate, quartz and combinations thereof.
7. The multilayered construction of claim 1 wherein said filler material comprises barium titanate.
8. The multilayered construction of claim 1 wherein at least one of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer further comprises from about 1% to about 90% by weight of a filler material.
9. The multilayered construction of claim 1 wherein each of said first thermosetting polymer layer, second thermosetting polymer layer and central polymerizable layer further comprise from about 1% to about 90% by weight of a filler material.
10. The multilayered construction of claim 1 wherein the first electrically conductive layer and the second electrically conductive layer independently comprise a material selected from the group consisting of copper, zinc, brass, chrome, nickel, aluminum, stainless steel, iron, gold, silver, titanium, platinum and combinations thereof.
11. The multilayered construction of claim 1 wherein each of the first electrically conductive layer and the second electrically conductive layer comprises copper.

12. The multilayered construction of claim 1 wherein one or both of the first thermosetting polymer layer and the second thermosetting polymer layer comprise a material selected from the group consisting of an epoxy, a melamine, polyesters, polyester containing copolymers, a urethane, alkyd, a bis-maleimide triazine, a polyimide, an ester, polyarylene ethers, fluorinated polyarylene ethers, benzocyclobutenes, liquid crystal polymers, an allyated polyphenylene ethers, amines and combinations thereof.

13. The multilayered construction of claim 1 wherein both of the first thermosetting polymer layer and the second thermosetting polymer layer comprise an epoxy.

15. The multilayered construction of claim 1 wherein said central polymerizable layer comprises a polymerizable polyamide precursor.

18. The multilayered construction of claim 1 wherein each of the first and second electrically conductive layers have a thickness of from about 0.5 to about 200  $\mu\text{m}$ .

19. The multilayered construction of claim 1 wherein each of the first and second electrically conductive layers have a thickness of from about 5 to about 10  $\mu\text{m}$ .

20. The multilayered construction of claim 1 wherein each of the first and second thermosetting polymer layers have a thickness of from about 1 to about 15  $\mu\text{m}$ .

21. The multilayered construction of claim 1 wherein each of the first and second thermosetting polymer layers have a thickness of from about 1.5 to about 10  $\mu\text{m}$ .

22. The multilayered construction of claim 1 wherein the central polymerizable layer has a thickness of from about 1 to about 30  $\mu\text{m}$ .

23. The multilayered construction of claim 1 wherein the central polymerizable layer has a thickness of from about 5 to about 20  $\mu\text{m}$ .
24. The multilayered construction of claim 1 which has a capacitance of from about 100  $\text{pF}/\text{cm}^2$  to about 4,000  $\text{pF}/\text{cm}^2$ .
25. The multilayered construction of claim 1 wherein the dielectric constant of each of the first thermosetting polymer layer, second thermosetting polymer layer and central polymerizable layer is from about 3 to about 65.
26. The multilayered construction of claim 1 wherein the  $T_g$  of said thermosetting polymer layers is at least about  $180^\circ\text{C}$ .
27. The multilayered construction of claim 1 wherein the  $T_g$  of said central polymerizable layer is at least about  $220^\circ\text{C}$ .
28. The multilayered construction of claim 1 wherein each of said first and second electrically conductive layers comprise copper foils, each of said first and second thermosetting polymer layers comprise an epoxy and said central polymerizable layer comprises a polymerizable polyamide precursor.
29. The multilayered construction of claim 1 wherein each of said first and second electrically conductive layers comprise copper foils, each of said first and second thermosetting polymer layers comprise an epoxy, said central polymerizable layer comprises a polymerizable polyamide precursor, and wherein each of said thermosetting polymer layers and said central polymerizable layer further comprises a filler material.
30. The multilayered construction of claim 1 wherein said first thermosetting polymer layer is applied onto a surface of said first electrically conductive layer by coating, said second thermosetting polymer layer is applied onto a surface of said second electrically

conductive layer by coating, and said central polymerizable layer is applied onto a surface of the first thermosetting polymer layer by coating.

31. The multilayered construction of claim 1 wherein said first electrically conductive layer is attached to said second electrically conductive layer by lamination.

32. The multilayered construction of claim 1 in which at least one of the electrically conductive layers comprises a part of an electrical circuit.

33. A printed circuit board which comprises the multilayered construction of claim 1.

37. A multilayered construction suitable for forming capacitors which comprises:

- a) a first electrically conductive layer, having first and second surfaces;
  - b) a first thermosetting polymer layer, having first and second surfaces, on the first electrically conductive layer with the first surface of the first thermosetting polymer layer on the second surface of the first electrically conductive layer;
  - c) a central polymerizable layer, having first and second surfaces, on the first thermosetting polymer layer with the first surface of the central polymerizable layer on the second surface of the first thermosetting polymer layer, which central polymerizable layer comprises a polymerizable precursor of a polyethylene terephthalate, a polyethylene naphthalate, a polyvinyl carbazole, a polyphenylene sulfide, an aromatic polyamide, a polyether-nitrile, a polyether-ether-ketone, or combinations thereof;
  - d) a second thermosetting polymer layer, having first and second surfaces, on the central polymerizable layer with the first surface of the second thermosetting polymer layer on the second surface of the second surface of the central polymerizable layer; and
  - e) a second electrically conductive layer, having first and second surfaces, on the second thermosetting polymer layer with the first surface of the second electrically conductive layer on the second surface of the second thermosetting polymer layer;
- wherein each of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer optionally further comprises a filler material.

38. The multilayered construction of claim 37 wherein at least one of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer further comprises a filler material.
39. The multilayered construction of claim 37 wherein each of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer further comprises a filler material.
40. The multilayered construction of claim 37 wherein one or both of the first thermosetting polymer layer and the second thermosetting polymer layer comprise a material selected from the group consisting of an epoxy, a melamine, polyesters, polyester containing copolymers, a urethane, alkyd, a bis-maleimide triazine, a polyimide, an ester, polyarylene ethers, fluorinated polyarylene ethers, benzocyclobutenes, liquid crystal polymers, an allyated polyphenylene ethers, amines and combinations thereof.
41. The multilayered construction of claim 37 wherein each of said first and second thermosetting polymer layers comprise an epoxy.
42. The multilayered construction of claim 37 wherein each of said first and second thermosetting polymer layers comprise an epoxy and a filler.
44. The multilayered construction of claim 37 wherein said central polymerizable layer comprises a polymerizable polyamide precursor.
47. The multilayered construction of claim 37 wherein each of the first electrically conductive layer and second electrically conductive layer comprises copper.



#### IX. EVIDENCE APPENDIX

Attached is an International Preliminary Examination Report mailed on March 6, 2006 relating to PCT application number PCT/US05/01820, which corresponds to the present application. This document shows a statement by Examiner Kevin R. Kruer wherein he considered the PCT claims to be novel, inventive, and possessing inventive step. The IPER also includes a copy of the PCT claims which were considered by Examiner Kruer to be novel, inventive, and possessing inventive step. These claims are identical to the corresponding claims on appeal in the present application. This PCT evidence was before the examiner and argued in the March 10, 2006 response to the Final Rejection, and the examiner responded to this evidence in the March 30, 2006 Advisory Action. It is therefore a part of the record of this application. If necessary, it is requested that the Board take administrative notice of the USPTO agency action, under Federal Rule of Evidence 201, as well as 37 C.F.R. 41.152-154.

#### X. RELATED PROCEEDINGS APPENDIX

None.

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:  
RICHARD S. ROBERTS  
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## PCT

### NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of Mailing  
(day/month/year)

06 MAR 2006

Applicant's or agent's file reference

OM-11 (PCT)

#### IMPORTANT NOTIFICATION

International application No.

International filing date (day/month/year)

Priority date (day/month/year)

PCT/US05/01820

19 January 2005 (19.01.2005)

19 February 2004 (19.02.2004)

Applicant

OAK-MISTUI INC.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

#### 4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/US

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# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference OM-11 (PCT)	<b>FOR FURTHER ACTION</b>		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/US05/01820	International filing date (day/month/year) 19 January 2005 (19.01.2005)	Priority date (day/month/year) 19 February 2004 (19.02.2004)	
International Patent Classification (IPC) or national classification and IPC IPC: B32B 15/06( 2006.01),15/08( 2006.01);B21D 39/00( 2006.01) USPC: 428/615,621,623,624,625,626			
Applicant OAK-MISTUI INC.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.  
  
☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  
  
 These annexes consist of a total of 9 sheets.

3. This report contains indications relating to the following items:
  - ☒ Basis of the report
  - ☐ Priority
  - ☐ Non-establishment of report with regard to novelty, inventive step and industrial applicability
  - ☐ Lack of unity of invention
  - ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - ☐ Certain documents cited
  - ☐ Certain defects in the international application
  - ☐ Certain observations on the international application

Date of submission of the demand 18 August 2005 (18.08.2005)	Date of completion of this report 21 February 2006 (21.02.2006)
Name and mailing address of the IPEA/US Mail Stop PCT, Attn: IPEA/ US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer Kevin R. Kruer <u>KK</u> Telephone No. 571-272-1700

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US05/01820

## 1. Basis of the report

### 1. With regard to the elements of the international application:\*

- ☐ the international application as originally filed.
- ☒ the description:  
 pages 1-21 as originally filed  
 pages NONE, filed with the demand  
 pages NONE, filed with the letter of \_\_\_\_\_
- ☒ the claims:  
 pages NONE, as originally filed  
 pages 22-30, as amended (together with any statement) under Article 19  
 pages NONE, filed with the demand  
 pages NONE, filed with the letter of \_\_\_\_\_
- ☒ the drawings:  
 pages 1/1, as originally filed  
 pages NONE, filed with the demand  
 pages NONE, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
 pages NONE, as originally filed  
 pages NONE, filed with the demand  
 pages NONE, filed with the letter of \_\_\_\_\_

### 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

### 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

### 4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages NONE
- ☐ the claims, Nos. NONE
- ☐ the drawings, sheets/fig NONE

### 5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/US05/01820**V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. STATEMENT**

Novelty (N)	Claims <u>1-41</u>	YES
	Claims <u>NONE</u>	NO
Inventive Step (IS)	Claims <u>1-41</u>	YES
	Claims <u>NONE</u>	NO
Industrial Applicability (IA)	Claims <u>1-41</u>	YES
	Claims <u>NONE</u>	NO

**2. CITATIONS AND EXPLANATIONS**

Claims 1-41 meet the novelty requirement under PCT Article 33(2) and the inventive step requirement under PCT Article 33(3). Specifically, applicant has amended the claims such that the central polymerizable layer comprises a precursor of polyethylene terephthalate, polyethylene naphthalate, polyvinyl carbazole, a polyphenylene sulfide, an aromatic polyamide, a polyether-nitrile, a polyether-ether-ketone, or combinations thereof. The prior art fails to teach the claimed multilayered construction comprising said specified central polymerizable layer.

Furthermore, claims 1-41 meet the criteria set out in PCT Article 33(4) and thus have industrial applicability because the claimed subject matter can be made or used in industry.

----- NEW CITATIONS -----

What is claimed is:

1. A multilayered construction suitable for forming capacitors which is formed by a process which comprises:

- a) applying a first thermosetting polymer layer onto a surface of a first electrically conductive layer;
  - b) applying a central polymerizable layer onto a surface of the first thermosetting polymer layer, which central polymerizable layer comprises a polymerizable precursor of a polyethylene terephthalate, a polyethylene naphthalate, a polyvinyl carbazole, a polyphenylene sulfide, an aromatic polyamide, a polyether-nitrile, a polyether-ether-ketone, or combinations thereof;
  - c) applying a second thermosetting polymer layer onto a surface of a second electrically conductive layer; thereafter
  - d) attaching the first electrically conductive layer to the second electrically conductive layer such that each of the first and second thermosetting polymer layers and the central polymerizable layer are positioned between the first and second electrically conductive layers; and thereafter
  - e) polymerizing said polymerizable layer;
- wherein each of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer optionally further comprises a filler material.

2. The multilayered construction of claim 1 wherein at least one of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer further comprises a filler material.

3. The multilayered construction of claim 1 wherein both of said first and second thermosetting polymer layers further comprise a filler material.

4. The multilayered construction of claim 1 wherein said central polymerizable layer further comprises a filler material.

5. The multilayered construction of claim 1 wherein each of said first thermosetting polymer layer, second thermosetting polymer layer and said central polymerizable layer further comprise a filler material.
- 5 6. The multilayered construction of claim 1 wherein said filler material comprises a material selected from the group consisting of ceramics, barium titanate, boron nitride, aluminum oxide, silica, strontium titanate, barium strontium titanate, quartz and combinations thereof.
- 10 7. The multilayered construction of claim 1 wherein said filler material comprises barium titanate.
8. The multilayered construction of claim 1 wherein at least one of said first thermosetting polymer layer, said second thermosetting polymer layer and said  
15 central polymerizable layer further comprises from about 1% to about 90% by weight of a filler material.
9. The multilayered construction of claim 1 wherein each of said first thermosetting polymer layer, second thermosetting polymer layer and central  
20 polymerizable layer further comprise from about 1% to about 90% by weight of a filler material.
10. The multilayered construction of claim 1 wherein the first electrically conductive layer and the second electrically conductive layer independently  
25 comprise a material selected from the group consisting of copper, zinc, brass, chrome, nickel, aluminum, stainless steel, iron, gold, silver, titanium, platinum and combinations thereof.

11. The multilayered construction of claim 1 wherein each of the first electrically conductive layer and the second electrically conductive layer comprises copper.

12. The multilayered construction of claim 1 wherein one or both of the first thermosetting polymer layer and the second thermosetting polymer layer comprise a material selected from the group consisting of an epoxy, a melamine, polyesters, polyester containing copolymers, a urethane, alkyd, a bis-maleimide triazine, a polyimide, an ester, polyarylene ethers, fluorinated polyarylene ethers, benzocyclobutenes, liquid crystal polymers, an allyated polyphenylene ethers, amines and combinations thereof.

13. The multilayered construction of claim 1 wherein both of the first thermosetting polymer layer and the second thermosetting polymer layer comprise an epoxy.

14. The multilayered construction of claim 1 wherein said central polymerizable layer comprises a polymerizable polyamide precursor.



15. The multilayered construction of claim 1 wherein each of the first and second electrically conductive layers have a thickness of from about 0.5 to about 200  $\mu\text{m}$ .

16. The multilayered construction of claim 1 wherein each of the first and second electrically conductive layers have a thickness of from about 5 to about 10  $\mu\text{m}$ .

17. The multilayered construction of claim 1 wherein each of the first and second thermosetting polymer layers have a thickness of from about 1 to about 15  $\mu\text{m}$ .

18. The multilayered construction of claim 1 wherein each of the first and second thermosetting polymer layers have a thickness of from about 1.5 to about 10  $\mu\text{m}$ .

19. The multilayered construction of claim 1 wherein the central polymerizable layer has a thickness of from about 1 to about 30  $\mu\text{m}$ .

20. The multilayered construction of claim 1 wherein the central polymerizable layer has a thickness of from about 5 to about 20  $\mu\text{m}$ .

21. The multilayered construction of claim 1 which has a capacitance of from about 100  $\text{pF}/\text{cm}^2$  to about 4,000  $\text{pF}/\text{cm}^2$

22. The multilayered construction of claim 1 wherein the dielectric constant of each of the first thermosetting polymer layer, second thermosetting polymer layer and central polymerizable layer is from about 3 to about 65.

23. The multilayered construction of claim 1 wherein the Tg of said thermosetting polymer layers is at least about 180°C.
24. The multilayered construction of claim 1 wherein the Tg of said central polymerizable layer is at least about 220°C.
25. The multilayered construction of claim 1 wherein each of said first and second electrically conductive layers comprise copper foils, each of said first and second thermosetting polymer layers comprise an epoxy and said central polymerizable layer comprises a polymerizable polyamide precursor.
26. The multilayered construction of claim 1 wherein each of said first and second electrically conductive layers comprise copper foils, each of said first and second thermosetting polymer layers comprise an epoxy, said central polymerizable layer comprises a polymerizable polyamide precursor, and wherein each of said thermosetting polymer layers and said central polymerizable layer further comprises a filler material.
27. The multilayered construction of claim 1 wherein said first thermosetting polymer layer is applied onto a surface of said first electrically conductive layer by coating, said second thermosetting polymer layer is applied onto a surface of said second electrically conductive layer by coating, and said central

polymerizable layer is applied onto a surface of the first thermosetting polymer layer by coating.

28. The multilayered construction of claim 1 wherein said first electrically conductive layer is attached to said second electrically conductive layer by lamination.

29. The multilayered construction of claim 1 in which at least one of the electrically conductive layers comprises a part of an electrical circuit.

30. A printed circuit board which comprises the multilayered construction of claim 1.

31. A process for forming a multilayered construction suitable for forming capacitors which comprises:

- a) applying a first thermosetting polymer layer onto a surface of a first electrically conductive layer;
  - b) applying a central polymerizable layer onto a surface of the first thermosetting polymer layer;
  - c) applying a second thermosetting polymer layer onto a surface of a second electrically conductive layer; thereafter
  - d) attaching the first electrically conductive layer to the second electrically conductive layer such that each of the first and second thermosetting polymer layers and the central polymerizable layer are positioned between the first and second electrically conductive layers; and thereafter
  - e) polymerizing said polymerizable layer;
- wherein each of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer optionally further comprises a

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filler material.

32. The process of claim 34 wherein the first and second thermosetting polymer layers are applied as liquids onto the first and second electrically conductive layers.

33. The process of claim 34 wherein the first and second thermosetting polymer layers are applied as liquids onto the first and second electrically conductive layers and then at least partially dried.

34. A multilayered construction suitable for forming capacitors which comprises:

- a) a first electrically conductive layer, having first and second surfaces;
- b) a first thermosetting polymer layer, having first and second surfaces, on the first electrically conductive layer with the first surface of the first thermosetting polymer layer on the second surface of the first electrically conductive layer;
- c) a central polymerizable layer, having first and second surfaces, on the first thermosetting polymer layer with the first surface of the central polymerizable layer on the second surface of the first thermosetting polymer layer, which central polymerizable layer comprises a polymerizable precursor of a polyethylene terephthalate, a polyethylene naphthalate, a polyvinyl carbazole, a polyphenylene sulfide, an aromatic polyamide, a polyether-nitrile, a polyether-ether-ketone, or combinations thereof;
- d) a second thermosetting polymer layer, having first and second surfaces, on the central polymerizable layer with the first surface of the second thermosetting polymer layer on the second surface of the second surface of the central polymerizable layer; and
- e) a second electrically conductive layer, having first and second surfaces, on the second thermosetting polymer layer with the first surface of the second electrically conductive layer on the second surface of the second thermosetting polymer layer; wherein each of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer optionally further comprises a

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filler material.

35. The multilayered construction of claim 37 wherein at least one of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer further comprises a filler material.

36. The multilayered construction of claim 37 wherein each of said first thermosetting polymer layer, said second thermosetting polymer layer and said central polymerizable layer further comprises a filler material.

37. The multilayered construction of claim 37 wherein one or both of the first thermosetting polymer layer and the second thermosetting polymer layer comprise a material selected from the group consisting of an epoxy, a melamine, polyesters, polyester containing copolymers, a urethane, alkyd, a bis-maleimide triazine, a polyimide, an ester, polyarylene ethers, fluorinated polyarylene ethers, benzocyclobutenes, liquid crystal polymers, an allyated polyphenylene ethers, amines and combinations thereof.

38. The multilayered construction of claim 37 wherein each of said first and second thermosetting polymer layers comprise an epoxy.

39. The multilayered construction of claim 37 wherein each of said first and second thermosetting polymer layers comprise an epoxy and a filler.

40. The multilayered construction of claim 37 wherein said central polymerizable layer comprises a polymerizable polyamide precursor.

41. The multilayered construction of claim 37 wherein each of the first electrically conductive layer and second electrically conductive layer comprises copper.